

No. 5109

LA7416,7416M

Playback Amplifier and Record Amplifier for VHS VCRs

Overview

The LA7416 and LA7416M are playback and record amplifier ICs for four-head VHS VCRs. When used in conjunction with the video signal processing ICs of the LA7420/30 series, it is possible to eliminate the need to adjust the Y/C record current.

Functions

- · 4-channel playback amplifier.
- 2-channel recording amplifier (AGC built-in).
- · REC/PB mode switching head switch circuit.
- . Envelope wave detection (for auto-tracking).
- Envelope comparator.

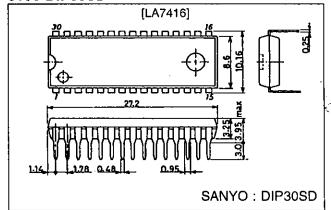
Features

- The record amplifier provides stable record characteristics in constant current drive mode, which is able to withstand load fluctuations. In addition, the built-in AGC eliminates the need to adjust the record current.
- Designed to share printed circuit boards with the LA7411/7411M (for 2-head systems).

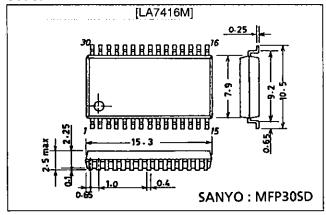
Package Dimensions

unit: mm

3196-DIP30SD



3073A- MFP30SD



Specifications

Maximum Ratings at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{CC} max		7.0	V
Allowable power dissipation	Dd	T- 605 -0	650	mW
	Pd max	Ta ≦65 °C	*500	mW
Operating temperature	Торг		-10 to +65	°C
Storage temperature	Tstg		-40 to +150	°C

^{*:} LA7416M Pd max value which represents the value when mounted on the board.

Operating Conditions at Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	v _{cc}		5.0	V
Operating voltage range	V _{CC} op		4.8 to 5.5	V

Electrical Characteristics at Ta = 25 °C

Paramet	er		Symbol	Input	Output	Conditions	T2	T4	T5	min	typ	max	Unit
[PB Mode]			•	·		T15: 5.0 V	TRCK	НА	SW30				
						T13: Open			MUTE				
						T7: Open			ļ				
Current consumption			CCP			Pin 15 input	Open	0	0	26	30	34	mA
Voltage gain	SP L	CH1	C 1	T20A	T10A	current V _I = 38 mVp-p	Open	0	0	54.0	57.0	60.0	dB
voltage gain	SP H	CH2	G _{VP} 1	T23A	T10A	f = 1 MHz	Open	0	2.5	54.0	57.0	60.0	dB
	EP L	CH3		T27A	T10A		<u> </u>	5.0	2.5	56.0	59.0	62.0	dB
	EP H	CH4	G _{VP} 3 G _{VP} 4	T30A	T10A		Open Open	5.0	2.5	56.0	59.0	62.0	dB
Voltage gain difference		Un4	ΔG _{VP} 1	1304	IIIOA	G _{VP} 1 — G _{VP} 2	Open	5.0	2.5	-1	39.0	+1	dB
Voltage gain differend			ΔG _{VP} 2			G _{VP} 3 — G _{VP} 4				-1	0	+1	dB
Intermode gain differen			ΔG _{VP} E	L		G _{VP} 3 — G _{VP} 1			1	1.0	2.0	3.0	dB
Equivalent input	01100	CH1	V _{NIN} 1	T20A	T10A	After 1.1 MHz	Open	0	0	1.0	1.1	1.5	μVrms
noise voltage		ÇH2	V _{NIN} 2	T23A	TIOA	LPF	Open	0	2.5		1.1	1.5	μVrms
		СНЗ	V _{NIN} 3	T27A	T10A	V _{OUT}	Open	5.0	0		1.1	1.5	μVrms
		CH4	V _{NIN} 4	T30A	T10A	G _{VP} 1,2,3,4	Open	5.0	2.5		1.1	1.5	μVrms
Frequency characteristics	stics	CH1	ΔVfp1	T20A	T10A	V _i = 38 mVp-p f = 7 MHz	Open	0	0	-2.5	+1	·	dB
1	,	CH2	ΔVfp2	T23A	T10A		Open	0	2.5	-2.5	+1		dB
	CH3	ΔVfp3	T27A	T10A	V _{OUT} G _{VP} 1,2,3,4 output ratio	Open	5.0	0	-2.5	+1		dB	
	CH4	ΔVfp4	T30A	T10A		Open	5.0	2.5	-2.5	+1		dB	
Secondary		CH1	V _{HDP} 1	T20A	T10A	V _I = 38 mVp-p f = 4 MHz 8 M component 4 M component output ratio	Open	0	0		-40	-35	dB
harmonic distortion		CH2	V _{HDP} 2	T23A	T10A		Open	0	2.5		-40	-35	dB
		СНЗ	V _{HDP} 3	T27A	T10A		Open	5.0	0		-40	-35	dB
		CH4	V _{HDP} 4	T30A	T10A		Open	5.0	2.5		-40	-35	dB
Maximum output leve	el	CH1	V _{OMP} 1	T20A	T10A	f = 1 MHz	Open	0	0	1.0	1.2		Vp-p
		CH2	V _{OMP} 2	T23A	T10A	Output level	Open	0	2.5	1.0	1.2		Vp-p
		СНЗ	V _{OMP} 3	T27A	T10A	when tertiary distortion of the	Open	5.0	0	1.0	1.2		Vp-p
		CH4	V _{OMP} 4	T30A	T10A	output is -30 dB	Open	5.0	2.5	1.0	1.2		Vp- p
Cross-talk		CH1	V _{CR} 1	T23A	T10A	V _I = 38 mVp-p	Open	0	0		-40	-35	dB
SP (Note 1)				T27A	T10A	f = 4 MHz	Open	0	0		-40	-35	dB
		1 1		T30A	T10A	VOUT	Open	0	0		-40	-35	dB
		CH2	V _{CR} 2	T20A	T10A	G _{VP} 1,2	Open	0	2.5		-40	-35	dB
				T27A	T10A]	Open	0	2.5		-40	-35	dB
				T30A	T10A		Open	0	2.5		-40	-35	₫₿
Cross-talk EP (Note 1)		СНЗ	CH3 V _{CR} 3	T20A	T10A	V _I = 38 mVp-p f = 4 MHz VOUT G _{VP} 3,4	Open	5.0	0		-40	-35	dΒ
				T23A	T10A		Open	5.0	0		-40	-35	dB
				T30A	T10A		Open	5.0	0		-40	-35	dB
		CH4	V _{CR} 4	T20A	T10A		Open	5.0	2.5		-40	-35	₫B
			T23A		T10A		Open	5.0	2.5		-4 0	-35	dB
				T27A	T10A		Open	5.0	2.5		-40	-35	dB

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Parameter	Symbol	Input	Output	Conditions	T2	T4	T5	min	typ	max	Unit
Output DC offset	∆V _{ODC} 1		T10A	CH1—CH2	Open		0_	-100	0	+100	mV
					Open	0	2.5	-100	0	+100	m۷
	ΔV _{ODC} 2		T10A	СН3—СН4	Open		0	-100	0	+100	mV
					Open	5.0	2.5	-100	0	+100	мV
	ΔV _{ODC} 3		T10A	СН1—СН3	Open	0		-100	0	+100	mV
·					Open	5.0	0	-100	0	+100	m۷
	∆V _{ODC} 4		T10A	CH2—CH4	Open	0		-100	0	+100	mV
					Open	5.0	2.5	-100	0	+100	mV
	∆V _{ODC} 5		T10A	CH1—CH4	Open	0	0	-100	0	+100	mV
					Open	5.0	2.5	-100	0	+100	mV
İ	ΔV _{ODC} 6	i	T10A	CH2—CH3	Open	0	2.5	-100	0	+100	mV
			<u> </u>		Open	5.0	0	-100	0	+100	m۷
Envelope wave detection output pin voltage	ν _{ΕΝΛ} ,		Т8	T8 DC voltage with no input	Open	0	0	0	0.8	1.5	V
Envelope wave detection	V _{ENVSP} 1	T20A	T8	f = 4 MHz,	Open	0	0	2.1	2.6	3.1	٧
voltage SP1				T10A: Adjusted to 175 mVp-p							
Envelope wave detection	V _{ENV\$P} 2	T20A	T8	f = 4 MHz,	Open	0	0	4.5	4.8	5.0	V,
voltage SP2				T10A: Adjusted							*
			ļ <u>-</u> _	to 450 mVp-p			<u> </u>		2 -		
Envelope wave detection	V _{ENVEP} 1	T27A	T8	f = 4 MHz,	Open	5.0	0	2.0	2.5	3.0	٧
voltage EP1				T10A: Adjusted to 125 mVp-p				1	i		
Envelope wave detection	V _{ENVEP} 2	T27A	T8	f = 4 MHz.	Open	5.0	0	4.5	4.8	5.0	V
voltage EP2	YENVEPE	16/7.	'0	T10A: Adjusted	Open	0.0		7.0	7.0	0.0	•
				to 350 mVp-p]						
Comparator output voltage 1	V _{COMP} 1	T20A	T3	f = 4 MHz,	5.0	0	0		0.4	0.7	٧
				$V_I = 38 \text{ mVp-p}$				1	,	ļ	
			·	T3 DC voltage						Ļ	
Comparator output voltage 2	V _{COMP} 2	T27A	T3	f = 4 MHz,	5.0	5.0	0	4.5	4.8		V
]		V _I = 38 mVp-p T3 DC voltage							
ON resistance of SW-Tr which is	R _{PON} 17	·	P-17	DC difference	+			 	4.0	6.0	Ω
turned ON in PB mode	I LIBON LA		'''	measured for					1.0	0.0	**
	R _{PON} 18		P-18	1 mA, 2 mA				1	4.0	6.0	Ω
	1011			current inflow	1					J	
ON resistance of SW-Tr which is	R _{PON} 21		P-21	DC difference	Open	5.0			4.0	6.0	Ω
turned ON in PB mode	R _{PON} 24		P-24	measured for	Open	5.0	<u> </u>		4.0	6.0	Ω
	R _{PON} 26		P-26	1 mA, 2 mA	Open	0			4.0	6.0	Ω
	R _{PON} 29		P-29	current inflow	Open	0			4.0	6.0	Ω
Trick 1 threshold level	TR1-1	[T2	Norma! →	*			3.2		5.0	V
			ļ <u>-</u> -	Trick 1	+		ļ	 	<u> </u>	1	ļ ,,
	TR1-2		T2	Trick 1 → Normal	*			1.2		2.8	٧
Trick 2 threshold level	TR2-1		T2	Normal →	*		1	0.0		0.8	٧
				Trick 2		<u> </u>			<u> </u>		
	TR2-2		T2	Trick 2 →	*			1.2		2.8	٧
			<u> </u>	Normal			ļ		<u> </u>	<u>.</u>	ļ
HAPB threshold level	HAP-1		T4	SP → EP	_	*		1.8	<u> </u>	5.0	V
	HAP-2		T4	EP → SP	4		<u> </u>	0.0	<u> </u>	1.4	V
SW30 threshold level	SW30-1		T5	Lch → Hch	1		<u> </u>	1.2	<u> </u>	5.0	V
	SW30-2		T5	Hch → Lch		<u> </u>	*	0.0	<u> </u>	0.8	V

Note 1: Status where input stage L (8.2 $\mu H)$ is shorted

Note: Because the T4 (HA) control switching timing is synchronized with T6 (H-Sync), a trigger pulse (0 V to 5 V to 0 V) must be input to T6 before measuring each parameter for the LA7416/M.

"*" represents output pins.

LA7416,7416M

Electrical Characteristics at Ta = 25 °C

Parameter	Symbol	Input	Output	Conditions	T13	T4	T5	min	typ	max	Unit
[REC Mode]	-,			T15: 5.0 V	REC	НА	SW30			-	1
•				T2: Open	Adj2		MUTE	i			
	, !			T6: 5.0 V	1			:			
				T7: 5.0 V							
Current consumption	ICCP			Pin 15 current	Open	0	0	50	55	60	mA
REC AGC	 	T11A	T21A	input f = 4 MHz	Open	0	0	147	156	165	mVp-p
Amp output level	V _{RSP}	T11A	T26A	V _I = 200 mVp-p	Open	5.0	0	116	123		mVp-p
Intermode gain difference	ΔG _{VR}	1117	120/	V _{RSP} /V _{REP}	Open	· • · · ·		1.30	2.05	2.80	dB
REC	ΔGVR ΔV _{AGC} 1-SP	T11A	T21A	f = 4 MHz.	Open	0	0	-1.00	0.5	1.0	dB
AGC Amp	BVAGC 1-01	ша	, EIA	V _I = 400 mVp-p	Opon	Ů	Ĭ		0.0	,	
control characteristics 1	۵V _{AGC} 1-EP	T11A	T26A	Output level/ V _{RSP. EP} ratio	Open	5.0	0		0.5	1.0	dB
REC AGC Amp	∆V _{AGC} 2-SP	T11A	T21A	f = 4 MHz, V _I = 100 mVp-p	Open	0	0	-1.0	9.5 -		dB
control characteristics 2	ΔV _{AGC} 2-EP	T11A	T26A	Output level/ V _{RSP, EP} ratio	Open	5.0	0	-1.0	-0.5		dB
REC AGC Amp	ΔV _{FRS}	T11A	T21A	f = 1 M, 7 MHz, V _I = 200 mVp-p	Open	0	0	-4.0	-3.0	-2.0	dB
frequency characteristics (Note 2)	ΔV _{FRE}	T11A	T26A	7 MHz/1 MHz, output ratio	Open	5.0	0	-4.0	-3.0	-2.0	ďΒ
REC AGC Amp	ΔV _{HDRS}	T11A	T21A	f = 4 MHz, V _I = 200 mVp-p	Open	0	0		-45	-4 0	dB
secondary harmonic level	ΔV _{HDRE}	T11A	T26A	8 M component 4 M component output ratio	Open	5.0	0		-45	-40	dB
REC AGC Amp	ΔV _{OMRS}	T11A	T21A	f = 4 MHz, Output level	Adj.	0	0	20	22		mAp-p
maximum output level (Note 3)	ΔV _{OMRE}	T11A	T26A	when secondary distortion of the output is -30 dB	Adj.	5.0	0	20	22		mAp-p
REC AGC Amp	ΔV _{MRS}	T11A	T21A	f = 4 MHz, V _I = 200 mVp-p	Open	0	5.0		-4 5	-40	dB
mute attenuation	ΔV _{MRE}	T11A	T26A	Output level/ VRSP, EP output ratio	Open	5.0	5.0		-45	-4 0	dB
REC AGC Amp	ΔV _{CYS}	T10A	T21A	T10A: f = 629 kHz,	Open	0	0		-45	-40	dB
mixed modulation relative level				V _I = 360 mVp-p T11A:							
	ΔV _{CYE}	T11A	T26A	f = 4 MHz, V _i = 200 mVp-p (4 M±629 k)/4 M output ratio	Open	5.0	0		-45	-4 0	dB
ON resistance of SW-Tr which	R _{RON} 17		P-17	DC difference	Open	5.0			4.0	6.0	Ω
switches between modes in REC			P-18	measured for	Open	0			4.0	6.0	Ω
mode	R _{RON} 21		P-21	1 mA, 2 mA	Open	5.0		· _	4.0	6.0	Ω
	R _{RON} 24		P-24	current inflow	Open	5.0	<u> </u>	1	4.0	6.0	Ω
	R _{RON} 26		P-26	1	Open	0	<u> </u>	<u> </u>	4.0	6.0	Ω
	R _{RON} 29		P-29	An	Open	0	 		4.0	6.0	Ω
HA REC threshold level	HAR-1		T4	SP → EP	-	·	 	1.8	 	5.0	V
DEC MITE three!	HAR-2	<u> </u>	T4	EP → SP	 	-	+	0.0	-	1.4	$\frac{V}{V}$
REC MUTE threshold level	MUTE-1		T5	MUTE OFF → ON	ļ	<u> </u>		3.4		5.0	
	MUTE-2		T5	MUTE ON → OFF			'	0.0		3.0	٧
REC/P8 threshold level	SW REC/ PB			T7: Control voltage				2.2		5.0	V

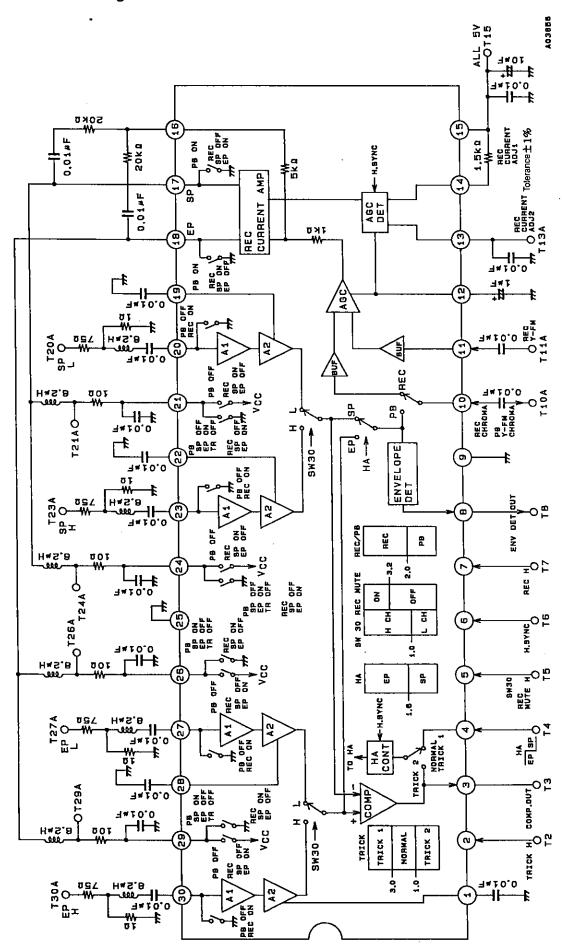
Note 2: Apply approximately 1.8 V DC to the AGC wave detection filter pin (pin 12) and fix the amplifier gain for measurement.

Note 3: Apply DC voltage to T13 (REC CUR. ADJ2) and adjust the output level.

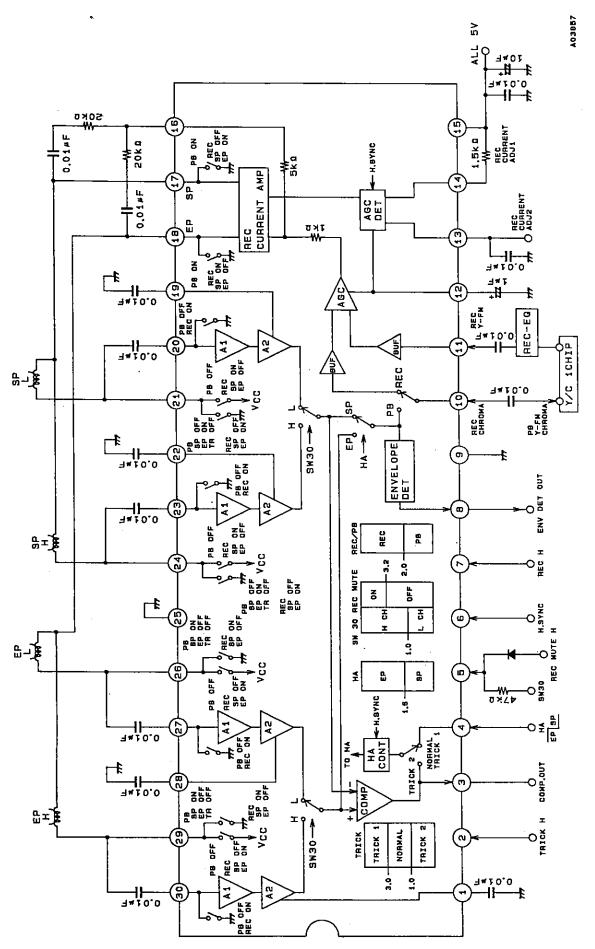
Note: Use a resistor with a tolerance of \pm 1.0% between pins 14 and 15.

[&]quot;*" represents output pins.

Test Circuit Diagram



Sample Application Circuit



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